

credit, they force us to root our knowledge and policy prescriptions in scientifically supportable evidence. As a result, we are less likely to make major policy errors, and the policies we do make are more likely to be effective.

References.....

1. Hay, J. W., and Mandes, G.: Home health care cost-function analysis. *Health Care Fin Rev* 5: 111-116 (1984).
2. Kurowski, B. T., Schlenker, R. E., and Tricarico, G.: Applied research in home health services, volume II. DHHS report No. OPEL 79-2. Washington, DC, 1979.
3. Day, S. R.: Geriatric home care: For whom? How long? How much? What then? HCFA grant No. 18-P-97362/5-01. Baltimore, MD, 1980.
4. Benjamin, A. E.: Determinants of state variations in home health utilization and expenditures under Medicare. *Med*

Care 24: 535 (1986).
5. Manton, K. G., and Hausner, T.: A multidimensional approach to case mix for home health services. *Health Care Fin Rev* 8: 37-54, summer 1987.
6. Foley, W.: Developing a patient classification system for home health care. *Pride Inst J* 6: 22-24 (1987).
7. Vladeck, B. C.: *Unloving care*. Basic Books, New York, NY, 1980.
8. Wisconsin Department of Health and Human Services: Home health agency utilization: Wisconsin, 1983-1984. Center for Health Statistics, Madison, 1985.
9. Kass, D. I.: Economies of scale and scope in the provision of home health services. *J. Health Econ* 6: 129-146, June 1987.
10. Nyman, J. A., Levey, S., and Rohrer, J. E.: RUGs and equity of access to nursing home care. *Med Care* 5: 361-372, May 1987.
11. Nyman, J. A.: The marginal cost of nursing home care: New York, 1983. *J. Health Econ* 7: 393-412, December 1988.

**Runners' Health Habits, 1985-
"The Alameda 7" Revisited**

C. A. MACERA, PhD
R. R. PATE, PhD
D. R. DAVIS, BA

Dr. Macera is an Associate Professor and Chairman, and Ms. Davis is a research assistant, Department of Epidemiology and Biostatistics, University of South Carolina School of Public Health; Dr. Pate is a Professor in the Department of Physical Education at the University of South Carolina College of Health.

Tearsheet requests to Dr. Macera, School of Public Health, University of South Carolina, Columbia, SC 29208.

Synopsis.....

Seven health habits were shown to be associated with longevity in a longitudinal study initiated in Alameda County, CA, in 1965. These habits (drinking moderately, exercising regularly, main-

taining desirable weight for height, eating breakfast, not eating snacks, sleeping 7 or 8 hours per day, and never having smoked) were recently examined in a sample of the U.S. population. Subgroups with low income and little education were found to have low frequency of these health habits. In this report, findings on the frequency of these habits in 966 habitual runners in South Carolina are presented separately for men and women and according to age, education, income, and weekly mileage.

Subgroups of the runners are surprisingly similar to subgroups of the national sample for several health habits. In addition, among the runners, low-income groups and those with little education have a lower frequency of good health habits relative to the other groups, although these differences are not statistically significant. Overall, about half of the runners practice five or more good health habits. These results indicate that even among healthy runners there is need for improvement in the adoption of health habits thought to be associated with reduced morbidity and mortality.

IN A 9-YEAR FOLLOWUP to a longitudinal study initiated in 1965 in Alameda County, CA, seven health habits were identified that were associated with physical health status and low mortality (1,2). These habits were drinking moderately or not at all, exercising regularly, maintaining desirable weight for height, eating breakfast, not eating

snacks, sleeping 7 or 8 hours per day, and never having smoked cigarettes. Researchers in several studies have attempted to describe the frequency of these habits in other populations and to relate these habits to health status. In a recent report on the frequency of the health habits in a sample of United States adults, important differences were

'... these seven habits were assessed in a statewide survey of South Carolina habitual distance runners. These runners are of particular interest because regular exercisers (especially runners) are thought to be concerned with their health status and to have more health knowledge than the general population.'

found in groups with little education and in low-income groups (3). These socially and economically disadvantaged groups had fewer positive lifestyle behaviors compared with the rest of the sample.

To determine if physically active adults also follow a healthy lifestyle, these seven habits were assessed in a statewide survey of South Carolina habitual distance runners. These runners are of particular interest because regular exercisers (especially runners) are thought to be concerned with their health status and to have more health knowledge than the general population. The extent to which these runners follow "good" health practices should reflect the potential for individuals to adopt positive health behaviors in the presence of adequate knowledge and concern.

Methods

Study participants. A mailing list of runners who wished to be notified of road races in the State was provided by the Physical Fitness Office of the South Carolina Department of Health and Environmental Control. A consent form and an 18-page questionnaire were mailed to each person on this list, and information on current and past running practices, other physical activities, history of injuries and illnesses, lifestyle behavior factors such as diet and alcohol use, and demographic characteristics was elicited for this report. Questions were designed to allow comparisons with national surveys, so that most of the "Alameda 7" measures could be obtained directly from the data responses. A composite health habit index, with a range of 0-7, was obtained by summing the positive responses to the seven health habits.

Eating breakfast. Subjects were asked whether they usually, sometimes, or never ate breakfast. Those

who scored positive on this health habit reported "usually" eating breakfast.

Snacks. Subjects were asked how often they ate snacks in addition to regular meals. Those who scored positive on this health habit were those who reported rarely or never eating snacks. Although there is some question as to whether snacking behavior and eating breakfast are important indicators of mortality and morbidity (4-6), these measures were included for comparison with other work (3).

Hours of sleep. The hours a respondent reported sleeping each day were categorized with 7 or 8 hours as the positive category for the health habit index, and less than 7 hours or more than 8 hours as less desirable alternatives.

Alcohol consumption. Questions on alcohol use during the past month measured total alcohol consumption (including beer, wine, and liquor), as well as occasions of drinking five or more drinks at one sitting. The data are presented for the average number of alcoholic drinks (beer, wine, or liquor) consumed on a day when drinking occurred. For the health habit index, fewer than five drinks (beer, wine, or liquor) at a sitting was considered positive.

Smoking. Current and past cigarette smoking behavior was assessed. Although Schoenborn (3) used current smoking for the health index, the Alameda study (1) identified never having smoked as positive for the summary index. For the runners, those who had never smoked were considered positive for the health habit index.

Ideal body weight. Respondents reported weight and height without shoes. A measure of desirable body weight for height was obtained using the 1960 Metropolitan Life Insurance Company tables (7). The 1983 Metropolitan tables show about a 10-pound increase in desirable weight from the 1960 tables, but the 1960 tables were used in this study for comparison with other work. Male and female runners were categorized into those at more than 10 percent below ideal weight, within 10 percent of ideal weight, and above 10 percent of ideal weight. Those who were within 10 percent of their ideal weight were considered positive for the health habit index.

Regular exercise. The measurement of regular exercise was somewhat different from other studies,

Table 1. Percent distribution for breakfast eating habits of runners 18–64 years of age, by gender and selected characteristics, Carolina Runners Study, 1985

| Characteristic | Men—eat breakfast | | | | Women—eat breakfast | | | |
|----------------------------|-------------------|---------|-----------|-----------------|---------------------|---------|-----------|-----------------|
| | Number | Usually | Sometimes | Rarely or never | Number | Usually | Sometimes | Rarely or never |
| Total | 781 | 69 | 12 | 20 | 163 | 64 | 13 | 23 |
| <i>Age</i> | | | | | | | | |
| 18–29 years | 75 | 76 | 15 | 9 | 31 | 58 | 19 | 23 |
| 30–44 years | 493 | 63 | 14 | 24 | 113 | 63 | 12 | 25 |
| 45–64 years | 213 | 79 | 7 | 14 | 19 | 79 | 5 | 16 |
| <i>Education</i> | | | | | | | | |
| 12 years or less | 72 | 61 | 17 | 22 | 18 | 61 | 22 | 17 |
| College graduate | 424 | 67 | 11 | 21 | 91 | 63 | 10 | 27 |
| Graduate school | 283 | 72 | 11 | 17 | 54 | 67 | 15 | 19 |
| <i>Income</i> | | | | | | | | |
| \$15,000 or less | 29 | 69 | 7 | 24 | 14 | 71 | 14 | 14 |
| \$15,001 to \$25,000 | 87 | 75 | 15 | 10 | 35 | 63 | 11 | 26 |
| \$25,001 to \$50,000 | 433 | 65 | 12 | 23 | 77 | 62 | 14 | 23 |
| More than \$50,000 | 232 | 73 | 10 | 16 | 37 | 65 | 11 | 24 |
| <i>Miles run per week</i> | | | | | | | | |
| 10 or less | 176 | 66 | 11 | 23 | 40 | 70 | 18 | 13 |
| 11 to 20 | 234 | 70 | 12 | 18 | 57 | 58 | 14 | 28 |
| 21 to 30 | 205 | 67 | 12 | 21 | 38 | 63 | 11 | 26 |
| More than 30 | 166 | 71 | 13 | 16 | 28 | 68 | 7 | 25 |

NOTE: Excludes persons with unknown breakfast habits.

since all participants were runners. Running activity was measured in two ways: days per week of running and miles run per week. For display in the tables, weekly mileage categories were 10 miles per week or less, 11 to 20 miles, 21 to 30 miles and more than 30 miles. For the health habit index, a positive score was given to those who ran 5 or more days a week for an average of at least 30 minutes.

Good health habits. In addition to the data on individual health habits, a summary score was created, in which 1 point was allowed for each of the following good habits: usually eating breakfast, rarely or never snacking, drinking moderately (fewer than five drinks at a sitting), never having smoked, being within 10 percent of ideal body weight for height, and running (exercising) five or more times a week.

Statistical analysis. All comparisons of categorical data were evaluated using a chi-square test on each set without adjustments for age or other socioeconomic characteristics. Men and women were analyzed separately.

Results

Of 1,576 questionnaires mailed, 3 were returned for improper addresses. Of 1,573 potential respon-

dents, 966 usable questionnaires were returned (61 percent response rate). A telephone survey of 100 randomly selected nonrespondents indicated that only 53 percent were runners and eligible to participate in the study. Assuming that the remaining 507 nonrespondents were also eligible at the same rate, the estimated response rate among the runners would be 75 percent. The demographic characteristics for the 53 eligible nonparticipants indicated that they were slightly younger than the respondents (36.3 years compared to 39.4 years). Both groups had the same average weekly mileage (22 miles), and the percent with at least a college education was also the same (70 percent). Men constituted a slightly greater percentage of the nonparticipant group (87 percent compared to 83 percent). None of these differences is statistically significant.

Of the 966 usable questionnaires, 19 were excluded because the respondent was less than 18 or over 64 years of age. Responses of the remaining 947 runners (784 men and 163 women) were used in this analysis. Their mean age was 39.4 years (40.1 for men and 36.0 for women). They were a highly educated group, with 90.4 percent having more than a high school education. Their income was also high, with 28.6 percent reporting an annual family income in excess of \$50,000. Race could not be used as a category, since 99 percent of the respondents were white. The mean miles run per

Table 2. Percent distribution for snacking habits of runners 18–64 years of age, by gender and selected characteristics, Carolina Runners Study, 1985

| Characteristic | Men—eat snacks | | | | Women—eat snacks | | | |
|----------------------------|----------------|---------|-----------|-----------------|------------------|---------|-----------|-----------------|
| | Number | Usually | Sometimes | Rarely or never | Number | Usually | Sometimes | Rarely or never |
| Total | 781 | 32 | 32 | 36 | 161 | 36 | 38 | 26 |
| <i>Age</i> | | | | | | | | |
| 18–29 years | 75 | 49 | 35 | 16 | 31 | 35 | 39 | 26 |
| 30–44 years | 494 | 31 | 34 | 35 | 112 | 38 | 37 | 26 |
| 45–64 years | 212 | 30 | 24 | 46 | 18 | 28 | 44 | 28 |
| <i>Education</i> | | | | | | | | |
| 12 years or less | 72 | 43 | 32 | 25 | 18 | 39 | 39 | 22 |
| College graduate | 425 | 30 | 34 | 36 | 89 | 33 | 42 | 26 |
| Graduate school | 282 | 33 | 28 | 39 | 54 | 41 | 31 | 28 |
| <i>Income</i> | | | | | | | | |
| \$15,000 or less | 29 | 31 | 41 | 28 | 14 | 14 | 50 | 36 |
| \$15,001 to \$25,000 | 87 | 48 | 24 | 28 | 35 | 40 | 34 | 26 |
| \$25,001 to \$50,000 | 434 | 32 | 31 | 37 | 76 | 45 | 34 | 21 |
| More than \$50,000 | 231 | 27 | 33 | 39 | 36 | 22 | 44 | 33 |
| <i>Miles run per week</i> | | | | | | | | |
| 10 or less | 177 | 34 | 31 | 34 | 40 | 45 | 30 | 25 |
| 11 to 20 | 234 | 31 | 31 | 38 | 56 | 29 | 45 | 27 |
| 21 to 30 | 204 | 32 | 35 | 33 | 37 | 32 | 38 | 30 |
| More than 30 | 166 | 32 | 28 | 40 | 28 | 43 | 36 | 21 |

NOTE: Excludes persons with unknown snacking habits.

Table 3. Percent distribution for hours of sleep of runners 18–64 years of age, by gender and selected characteristics, Carolina Runners Study, 1985

| Characteristic | Men—hours of sleep | | | | Women—hours of sleep | | | |
|----------------------------|--------------------|-----------|-----|-----------|----------------------|-----------|-----|-----------|
| | Number | 6 or less | 7–8 | 9 or more | Number | 6 or less | 7–8 | 9 or more |
| Total | 784 | 17 | 81 | 3 | 163 | 14 | 79 | 7 |
| <i>Age</i> | | | | | | | | |
| 18–29 years | 75 | 16 | 77 | 7 | 31 | 16 | 77 | 6 |
| 30–44 years | 495 | 15 | 83 | 1 | 113 | 13 | 78 | 9 |
| 45–64 years | 214 | 20 | 76 | 4 | 19 | 11 | 89 | 0 |
| <i>Education</i> | | | | | | | | |
| 12 years or less | 73 | 22 | 77 | 1 | 18 | 11 | 78 | 11 |
| College graduate | 426 | 16 | 82 | 2 | 91 | 16 | 78 | 5 |
| Graduate school | 283 | 16 | 80 | 4 | 54 | 9 | 81 | 9 |
| <i>Income</i> | | | | | | | | |
| \$15,000 or less | 29 | 21 | 80 | 0 | 14 | 21 | 64 | 14 |
| \$15,001 to \$25,000 | 87 | 17 | 79 | 5 | 35 | 20 | 71 | 9 |
| \$25,001 to \$50,000 | 434 | 18 | 80 | 2 | 77 | 13 | 81 | 6 |
| More than \$50,000 | 234 | 14 | 83 | 3 | 37 | 5 | 89 | 5 |
| <i>Miles run per week</i> | | | | | | | | |
| 10 or less | 177 | 14 | 85 | 1 | 40 | 10 | 85 | 5 |
| 11 to 20 | 234 | 18 | 80 | 1 | 57 | 14 | 75 | 11 |
| 21 to 20 | 206 | 17 | 80 | 3 | 38 | 18 | 79 | 3 |
| More than 30 | 167 | 16 | 78 | 6 | 28 | 11 | 79 | 11 |

week was 23.5 for men and 21.9 for women. The mean number of days of running per week was 4.4 for men and 4.6 for women.

Major findings of the 1985 survey of habitual runners are summarized for each of the seven health habits. Data are presented in tabular form by age group, education, income, and miles per

week categories. All references to the national data are from the Schoenborn report (3).

Eating breakfast. Findings on breakfast habits are shown in table 1. Overall, 69 percent of male runners and 64 percent of female runners reported usually eating breakfast, compared with 54 percent

Table 4. Percent distribution for average number of alcoholic drinks (beer, wine, or liquor) consumed per day when respondents drank in last month by runners 18–64 years of age, by gender and selected characteristics, Carolina Runners Study, 1985

| Characteristic | Men—drinks per day when drinking | | | | | Women—drinks per day when drinking | | | | |
|----------------------------|----------------------------------|---------------|------------|------------|-----------|------------------------------------|---------------|------------|------------|-----------|
| | Number | Did not drink | 1–2 drinks | 3–4 drinks | 5 or more | Number | Did not drink | 1–2 drinks | 3–4 drinks | 5 or more |
| Total | 778 | 19 | 52 | 23 | 6 | 163 | 20 | 61 | 17 | 2 |
| Age | | | | | | | | | | |
| 18–29 years | 75 | 21 | 38 | 31 | 11 | 31 | 19 | 58 | 16 | 6 |
| 30–44 years | 490 | 16 | 52 | 26 | 6 | 113 | 20 | 61 | 18 | 1 |
| 45–64 years | 213 | 24 | 56 | 15 | 5 | 19 | 21 | 68 | 11 | 0 |
| Education | | | | | | | | | | |
| 12 years or less | 72 | 36 | 38 | 14 | 13 | 18 | 56 | 39 | 6 | 0 |
| College graduate | 423 | 16 | 50 | 27 | 7 | 91 | 20 | 60 | 19 | 2 |
| Graduate school | 281 | 18 | 58 | 21 | 4 | 54 | 9 | 72 | 17 | 2 |
| Income | | | | | | | | | | |
| \$15,000 or less | 29 | 24 | 48 | 24 | 3 | 14 | 36 | 50 | 14 | 0 |
| \$15,001 to \$25,000 | 86 | 30 | 36 | 22 | 12 | 35 | 23 | 51 | 23 | 3 |
| \$25,001 to \$50,000 | 433 | 19 | 50 | 24 | 6 | 77 | 19 | 65 | 13 | 3 |
| More than \$50,000 | 230 | 13 | 61 | 21 | 5 | 37 | 14 | 68 | 19 | 0 |
| Miles run per week | | | | | | | | | | |
| 10 or less | 175 | 19 | 57 | 19 | 5 | 40 | 28 | 58 | 13 | 3 |
| 11 to 20 | 234 | 17 | 53 | 28 | 3 | 57 | 16 | 68 | 16 | 0 |
| 21 to 30 | 205 | 17 | 52 | 24 | 8 | 38 | 16 | 61 | 21 | 3 |
| More than 30 | 164 | 24 | 45 | 21 | 10 | 28 | 25 | 54 | 18 | 4 |

NOTE: Excludes persons with unknown alcohol drinking habits.

of men and 56 percent of women in the national sample. About 20 percent of the runners rarely or never ate breakfast, compared to 25 percent of the men and women in the national sample. For the male runners, those in the middle age group (30–44 years) were more likely to skip breakfast than either the younger or older runners. In this respect, the male runners were similar to the men in the national sample. Breakfast eating habits for the runners did not vary by education, income, or mileage category.

Snacking. Findings on snacking habits are shown in table 2. Overall, 32 percent of male runners and 36 percent of female runners reported usually snacking compared with 41 percent for men and 38 percent for women in this country. In addition, 36 percent of male runners and 26 percent of female runners reported rarely, or never snacking, compared with 29 percent for men and 28 percent for women nationally. The female runners were very similar to the women in the national sample, while the male runners reported less snacking than the men in the larger sample.

For male runners, snacking habits were strongly associated with age, in that younger men were more likely to snack than older men (49 percent to 30 percent). This finding is similar to the national sample. Among runners, there is also an association with income in that lower income male runners were less likely to rarely or never snack than high

income male runners (28 percent to 39 percent). Neither the men nor the women in the national sample were found to differ in snacking habits among income categories.

There were no differences in snacking habits among the runners by education or weekly mileage.

Hours of sleep. Findings on sleeping habits are shown in table 3. Overall, 81 percent of male runners and 79 percent of female runners reported 7–8 hours of sleep per day while 66 percent of men and women in the national sample reported 7–8 hours of sleep. Since age is associated with sleeping patterns in that older persons sleep less, the difference between the runners and the national sample could be due to the different age distributions.

For the runners, hours of sleep varied statistically by age and running habits. Those who ran more than 30 miles per week were more likely to sleep more than 8 hours than those who ran less. Unlike the national sample, there were no associations among the runners between education or income and hours of sleep.

Alcohol consumption. The average number of alcoholic drinks (beer, wine, or liquor) consumed in the past month is shown in table 4. Overall, about 20 percent of the runners reported no alcohol consumption in the past month. In the national sample, 39 percent of the men and 60

Table 5. Percent distribution for smoking status of runners 18–64 years of age, by gender and selected characteristics, Carolina Runners Study, 1985

| Characteristic | Men—smoking status | | | | Women—smoking status | | | |
|----------------------------|--------------------|-------|--------|---------|----------------------|-------|--------|---------|
| | Number | Never | Former | Current | Number | Never | Former | Current |
| Total | 781 | 55 | 42 | 3 | 162 | 60 | 36 | 4 |
| <i>Age</i> | | | | | | | | |
| 18–29 years | 75 | 83 | 15 | 3 | 31 | 77 | 23 | 0 |
| 30–44 years | 495 | 55 | 42 | 3 | 112 | 55 | 40 | 4 |
| 45–64 years | 211 | 44 | 53 | 3 | 19 | 58 | 37 | 5 |
| <i>Education</i> | | | | | | | | |
| 12 years or less | 73 | 42 | 51 | 7 | 18 | 44 | 56 | 0 |
| College graduate | 424 | 52 | 46 | 3 | 91 | 56 | 37 | 7 |
| Graduate school | 282 | 62 | 35 | 2 | 53 | 72 | 28 | 2 |
| <i>Income</i> | | | | | | | | |
| \$15,000 or less | 29 | 66 | 34 | 0 | 14 | 50 | 43 | 7 |
| \$15,001 to \$25,000 | 87 | 61 | 36 | 3 | 35 | 69 | 29 | 3 |
| \$25,001 to \$50,000 | 432 | 53 | 44 | 3 | 76 | 59 | 40 | 1 |
| More than \$50,000 | 233 | 55 | 42 | 3 | 37 | 57 | 35 | 8 |
| <i>Miles run per week</i> | | | | | | | | |
| 10 or less | 175 | 58 | 37 | 5 | 40 | 65 | 30 | 5 |
| 11 to 20 | 234 | 56 | 42 | 3 | 56 | 64 | 30 | 5 |
| 21 to 30 | 205 | 53 | 45 | 2 | 38 | 45 | 53 | 3 |
| More than 30 | 167 | 52 | 46 | 2 | 28 | 64 | 36 | 0 |

NOTE: Excludes persons with unknown smoking status.

Table 6. Percent distribution by desirable body weight of runners 18–64 years of age, by gender and selected characteristics, Carolina Runners Study, 1985

| Characteristic | Men—desirable body weight | | | | Women—desirable body weight | | | |
|----------------------------|---------------------------|--------------------|---------------------|--------------------|-----------------------------|--------------------|---------------------|--------------------|
| | Number | Below ¹ | Within ² | Above ³ | Number | Below ¹ | Within ² | Above ³ |
| Total | 784 | 6 | 63 | 31 | 163 | 16 | 69 | 15 |
| <i>Age</i> | | | | | | | | |
| 18–29 years | 75 | 15 | 61 | 24 | 31 | 26 | 58 | 16 |
| 30–44 years | 495 | 6 | 63 | 31 | 113 | 12 | 74 | 14 |
| 45–64 years | 214 | 3 | 63 | 34 | 19 | 21 | 60 | 20 |
| <i>Education</i> | | | | | | | | |
| 12 years or less | 73 | 8 | 61 | 30 | 18 | 6 | 67 | 28 |
| College graduate | 426 | 5 | 63 | 33 | 91 | 14 | 70 | 15 |
| Graduate school | 283 | 6 | 63 | 31 | 54 | 22 | 69 | 9 |
| <i>Income</i> | | | | | | | | |
| \$15,000 or less | 29 | 14 | 59 | 28 | 14 | 21 | 71 | 7 |
| \$15,001 to \$25,000 | 87 | 10 | 59 | 31 | 35 | 3 | 74 | 23 |
| \$25,001 to \$50,000 | 434 | 5 | 62 | 32 | 77 | 18 | 69 | 13 |
| More than \$50,000 | 234 | 4 | 65 | 30 | 37 | 22 | 65 | 14 |
| <i>Miles run per week</i> | | | | | | | | |
| 10 or less | 177 | 5 | 49 | 47 | 40 | 18 | 73 | 11 |
| 11 to 20 | 234 | 5 | 58 | 37 | 57 | 11 | 67 | 23 |
| 21 to 30 | 206 | 4 | 67 | 28 | 38 | 13 | 71 | 16 |
| More than 30 | 167 | 10 | 78 | 12 | 28 | 29 | 68 | 4 |

¹ 10 percent or more below ideal weight.

² No more than 10 percent above or below ideal weight.

³ More than 10 percent above ideal weight.

percent of the women reported no alcohol consumption in the previous 2 weeks. However, it is possible that the difference in the reference time periods could account for the difference in the prevalence of drinking habits between the two groups.

Significant associations were found for all characteristics (age, education, income, weekly mileage)

for male runners, but only for education for the female runners. As in the national sample, younger male runners, those with low income, and those with 12 or fewer years of education were more likely to drink five or more drinks on days when they drank than were older men, high-income men, and well-educated men. Also similar to the national sample, women with 12 or fewer years of education

Table 7. Percent distribution for days of exercise (running) of runners 18–64 years of age, by gender and selected characteristics, Carolina Runners Study, 1985

| Characteristic | Men—days of exercise per week | | | | Women—days of exercise per week | | | |
|----------------------------|-------------------------------|-----------|-----|-----------|---------------------------------|-----------|-----|-----------|
| | Number | 2 or less | 3–4 | 5 or more | Number | 2 or less | 3–4 | 5 or more |
| Total | 784 | 11 | 43 | 47 | 163 | 12 | 33 | 55 |
| <i>Age</i> | | | | | | | | |
| 18–29 years | 75 | 8 | 40 | 52 | 31 | 13 | 42 | 45 |
| 30–44 years | 495 | 11 | 42 | 47 | 113 | 12 | 33 | 56 |
| 45–64 years | 214 | 10 | 46 | 43 | 19 | 11 | 21 | 68 |
| <i>Education</i> | | | | | | | | |
| 12 years or less | 73 | 7 | 38 | 55 | 18 | 6 | 11 | 83 |
| College graduate | 426 | 12 | 44 | 44 | 91 | 18 | 34 | 48 |
| Graduate school | 283 | 10 | 42 | 47 | 54 | 4 | 39 | 57 |
| <i>Income</i> | | | | | | | | |
| \$15,000 or less | 29 | 7 | 38 | 55 | 14 | 21 | 21 | 57 |
| \$15,001 to \$25,000 | 87 | 14 | 37 | 49 | 35 | 11 | 31 | 57 |
| \$25,001 to \$50,000 | 434 | 11 | 42 | 47 | 77 | 12 | 35 | 53 |
| More than \$50,000 | 234 | 9 | 48 | 44 | 37 | 8 | 35 | 57 |
| <i>Miles run per week</i> | | | | | | | | |
| 10 or less | 177 | 43 | 52 | 5 | 40 | 48 | 45 | 8 |
| 11 to 20 | 234 | 2 | 78 | 6 | 57 | 0 | 54 | 46 |
| 21 to 30 | 206 | 0 | 27 | 73 | 38 | 0 | 11 | 89 |
| More than 30 | 167 | 1 | 4 | 95 | 28 | 0 | 4 | 96 |

were more likely not to drink in the past month than were those with more than 12 years of education. Alcohol consumption varied with mileage level, with men who ran more than 30 miles per week more likely to have five or more drinks on days when drinking occurred than low mileage male runners.

Smoking. Findings on current and past cigarette smoking habits are shown in table 5. Although 45 percent of the male runners and 40 percent of the female runners had ever smoked, only 3 percent of the men and 4 percent of the women were current smokers. In the general population sample, 33 percent of men and 28 percent of women reported current cigarette smoking, and 64 percent of men and 46 percent of women had ever smoked.

Level of education is the only characteristic that is statistically associated with smoking habits for both male and female runners. A higher percentage of “never” smokers were found in the higher levels of education along with a smaller percentage of current smokers. This trend is similar to the national sample.

For male and female runners, as the mileage category increases, the percentage of current smokers decreases and the percentage of former smokers increases, indicating that high mileage runners quit smoking at a higher rate than low mileage runners after adjusting for baseline smoking status. However, these differences are small (86 percent quit rate in the lowest mileage category and 96 percent

quit rate in the highest mileage category), and they are not statistically significant.

Body weight. Findings on maintenance of weight within 10 percent of ideal body weight are shown in table 6. Overall, 63 percent of the male runners and 69 percent of the female runners are within 10 percent of ideal body weight, compared to the national sample in which 45 percent of the men and women are within 10 percent of ideal body weight.

As in the national sample, more female runners than male runners are below 10 percent of ideal weight (16 percent for women and 6 percent for men), and more male runners than female runners are more than 10 percent of ideal weight (31 percent for men and 15 percent for women).

For male runners, age and weekly mileage are statistically associated with maintenance of weight. The more miles run per week, the more likely men are to be within the ideal weight category (49 percent for low mileage and 78 percent for high mileage). Younger men are more likely than older men to be at 10 percent or more under ideal weight (15 percent for younger and 3 percent for older).

Days per week of running. Findings on running habits by days per week of running are shown in table 7. Number of days per week of running is associated with mileage for both male and female runners, as is to be expected. However, it is not statistically associated with any other characteristic

Table 8. Percent distribution for number of miles run per week of runners 18–64 years of age, by gender and selected characteristics, Carolina Runners Study, 1985

| Characteristic | Men—miles per week | | | | | Women—miles per week | | | | |
|----------------------------|--------------------|------------|-------|-------|--------------|----------------------|------------|-------|-------|--------------|
| | Number | 10 or less | 11–20 | 21–30 | More than 30 | Number | 10 or less | 11–20 | 21–30 | More than 30 |
| Total | 784 | 23 | 30 | 26 | 21 | 163 | 25 | 35 | 23 | 17 |
| Age | | | | | | | | | | |
| 18–29 years | 75 | 16 | 28 | 31 | 25 | 31 | 32 | 39 | 10 | 19 |
| 30–44 years | 495 | 23 | 28 | 28 | 21 | 113 | 22 | 35 | 25 | 18 |
| 45–64 years | 214 | 24 | 35 | 20 | 22 | 19 | 26 | 26 | 37 | 11 |
| Education | | | | | | | | | | |
| 12 years or less | 73 | 15 | 27 | 18 | 40 | 18 | 11 | 27 | 56 | 6 |
| College graduate | 426 | 22 | 31 | 27 | 20 | 91 | 29 | 36 | 19 | 16 |
| Graduate school | 283 | 25 | 28 | 28 | 18 | 54 | 22 | 35 | 20 | 22 |
| Income | | | | | | | | | | |
| \$15,000 or less | 29 | 21 | 31 | 14 | 34 | 14 | 29 | 29 | 14 | 29 |
| \$15,001 to \$25,000 | 87 | 29 | 23 | 22 | 26 | 35 | 29 | 31 | 31 | 9 |
| \$25,001 to \$50,000 | 434 | 22 | 30 | 28 | 20 | 77 | 23 | 39 | 22 | 16 |
| More than \$50,000 | 234 | 22 | 31 | 26 | 21 | 37 | 22 | 32 | 22 | 24 |

Table 9. Percent distribution for total number of good health habits of runners 18–64 years of age, by gender and selected characteristics, Carolina Runners Study, 1985

| Characteristic | Men—good habits | | | | | Women—good habits | | | | |
|----------------------------|-----------------|-----|----|----|-----|-------------------|-----|----|----|-----|
| | Number | 0–3 | 4 | 5 | 6–7 | Number | 0–3 | 4 | 5 | 6–7 |
| Total | 784 | 22 | 29 | 30 | 20 | 163 | 19 | 27 | 29 | 25 |
| Age | | | | | | | | | | |
| 18–29 years | 75 | 17 | 31 | 39 | 13 | 31 | 26 | 29 | 29 | 16 |
| 30–44 years | 495 | 23 | 30 | 27 | 19 | 113 | 19 | 31 | 33 | 18 |
| 45–64 years | 214 | 20 | 25 | 31 | 24 | 19 | 11 | 26 | 26 | 37 |
| Education | | | | | | | | | | |
| 12 years or less | 73 | 26 | 33 | 30 | 12 | 18 | 6 | 33 | 28 | 33 |
| College graduate | 426 | 23 | 29 | 30 | 19 | 91 | 22 | 32 | 35 | 11 |
| Graduate school | 283 | 19 | 27 | 29 | 24 | 54 | 19 | 26 | 26 | 30 |
| Income | | | | | | | | | | |
| \$15,000 or less | 29 | 17 | 28 | 41 | 14 | 14 | 21 | 29 | 36 | 14 |
| \$15,001 to \$25,000 | 87 | 22 | 25 | 34 | 18 | 35 | 17 | 20 | 46 | 17 |
| \$25,001 to \$50,000 | 434 | 22 | 29 | 30 | 19 | 77 | 22 | 34 | 26 | 18 |
| More than \$50,000 | 234 | 21 | 29 | 29 | 24 | 37 | 14 | 32 | 27 | 27 |
| Miles run per week | | | | | | | | | | |
| 10 or less | 177 | 34 | 27 | 27 | 11 | 40 | 28 | 30 | 28 | 15 |
| 11 to 20 | 234 | 25 | 33 | 29 | 13 | 57 | 23 | 33 | 28 | 16 |
| 21 to 30 | 206 | 17 | 26 | 32 | 25 | 38 | 11 | 32 | 29 | 29 |
| More than 30 | 167 | 10 | 26 | 31 | 33 | 28 | 11 | 21 | 46 | 21 |

in male runners. It is associated with education in female runners; higher levels of education were associated with fewer days of running.

This measure is difficult to compare with the national sample categories of sedentary, moderately active, and very active, since no one in the runners groups could reasonably be considered sedentary.

Miles per week. Findings on weekly running mileage are shown in table 8. Overall, 21 percent of men and 17 percent of women reported more than 30 miles per week. The only characteristic that is statistically associated with miles per week is educa-

tion. A higher proportion of male runners with 12 or fewer years of education reported running 31 or more miles per week than did those with more than 12 years of education. For female runners, running more than 30 miles per week is more prevalent among those beyond a college level education. In the national sample, the “very active” category was positively associated with education for both men and women.

All health habits. Findings on good health habits (the health habit index) are shown in table 9. Overall, 20 percent of male runners and 25 percent

of female runners reported six or seven good health habits, compared with the national sample findings of 12 percent for men and 11 percent for women.

For male runners, the 31 miles per week group was three times as likely as the group who ran 10 or fewer miles per week to report six or seven good habits (33 percent for the high and 11 percent for the low). This finding is not unusual considering that days per week of exercise was used as one of the good health habits, and this variable is strongly associated with running mileage. However, there were no statistically significant associations of any other characteristic with good health habits. The percentage reporting four or five good habits was similar for the runners and the national sample—59 percent of the male runners and 56 percent of the female runners compared with 51 percent of the men and 56 percent of the women in the national sample.

Summary

In spite of the select nature of this study population and its small numbers, the distribution of several health habits is surprisingly similar to that of the sample of U.S. adults, although direct comparisons cannot be made. For example, as in the national sample, both breakfast and snacking habits were positively associated with age for male runners. Alcohol consumption also varied among subgroups of runners (similar to the national sample), for education, income, and age. As in the national sample, smoking habits are negatively associated with education. Unlike the national sample, snacking behavior among male runners varied with income. Physical activity and education are positively associated in female runners (as in the national sample), but negatively associated in male runners. Despite their increased physical activity, subgroups of the runners, that is, low-income and little education groups, do not score uniformly high on other health habits. Although the runners report a higher number of health habits overall, part of this is due to their high level of physical activity. Comparison of those with four or five health habits indicates about the same proportions in the runners as in the national sample.

Among the runners, high mileage male runners are more likely than low mileage male runners to sleep more than 8 hours a day, maintain ideal weight, have five or more drinks on days when they drink, run 5 or more days per week, and have six to seven good health habits. High mileage female runners are more likely than low mileage

female runners to run 5 or more days per week. For specific habits, high mileage runners do not score consistently better than low mileage runners, but when the health habit index is created, high mileage runners score better than low mileage runners. The advantage seems to be primarily in maintaining ideal weight and high levels of physical activity. Although these runners are generally healthy, only about half of them practice five or more good health habits, indicating that there is substantial room for improvement in this area. However, as in the Schoenborn report (3), these results represent a preliminary summary that must be interpreted with caution, since the data are not age-adjusted and many of the observed relationships may reflect differences in the underlying age distribution of the groups.

How well do these habits relate to morbidity? This issue will be subsequently examined in these runners, using 12 months of followup morbidity data. Further analyses will include adjustment for age and other possible confounders.

References.....

1. Belloc, N. B., and Breslow, L.: Relationship of physical health status and health practices. *Prev Med* 1: 409-421 (1972).
2. Breslow, L., and Enstrom, J. E.: Persistence of health habits and their relationship to mortality. *Prev Med* 9: 469-483 (1980).
3. Schoenborn, C. A.: Health habits of U.S. adults, 1985: The "Alameda 7" revisited. *Public Health Rep* 101: 571-580, November-December 1986.
4. Enstrom, J. E., Kanim, L. E., and Breslow, L.: the relationship between vitamin C intake, general health practices, and mortality in Alameda County, California. *Am J Public Health* 76: 1124-1130 (1986).
5. Berkman, L. F., and Breslow, L.: Health and ways of living: the Alameda County study. Oxford University Press, New York, 1983.
6. Wingard, D. L., Berkman, L. F., and Brand, R. J.: A multivariate analysis of health and related practices: a nine-year mortality follow-up of the Alameda County study. *Am J Epidemiol* 116: 765-775 (1982).
7. Metropolitan Life Insurance Company: Overweight, its prevention and significance. *Stat Bull Metropol Life Ins Co*, New York, 1960.